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Abstract

CONTINUOUS METHODS OF TRACING CHEMICAL CHANGES IN FLUIDS UNDER GAMMA IRRADIATION[x]

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Two methods: spectrophotometry and polarography have been adopted for the work in strong fields /of the order 100 rads per sec/ of gamma radiation. All factors influencing the measurement have been investigated. In the result of continuous measurement, kinetic curves are obtained showing changes of concentrations of different involved species in the function of the time of irradiation and the time after the irradiation. Sensitivities of the methods are 10^{-7} to 10^{-5} M/l, depending on the substance. Therefore at the dose rate of 100 rads/sec and the radiation yield G=1, the kinetic curves may be traced during the irradiations lasting only few seconds. The sensitivity may be reduced by several orders of magnitude so that kinetic curves of the G value equal even to 10000 /found in our laboratory/ may be followed. High sensitivity of the measurement enables us to obtain kinetics of medium-stable intermediates of radiolysis, namely /in the case of water/, of hydrogen peroxide and indirectly of peroxyorganic compounds, occuring as intermediates in chain oxydation reaction, initiated by radiation.

The developed techniques of continuous analysis during the irradiation served in research performed on several systems. Among them were systems enabling the classification of organic compounds according to their reactivity in irradiated solutions. Our methods made it possible to investigate the radiation chemistry of neutral /pH = 5-8,5/ solutions of ferrous salts. Methods of direct analysis during irradiation enabled us to find and investigate the chain reactions in alkaline solutions as well as a closer approach to the radiation chemistry of the neglected field of high pH-values.

With our methods a study was performed on industrial application of radiation induced oxidation of iron. Positive results were reached in cases, where organic compounds may be present in the solution.

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